

Impact of Lean Manufacturing Tools on Waste Reduction in Apparel Industry in North Western Province of Sri Lanka

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Abstract

The apparel industry in Sri Lanka remains a cornerstone of the national economy, contributing significantly to employment generation and export earnings; however, it continues to face challenges due to inefficiencies in production processes and high levels of material waste, particularly in the North Western Province, where many factories operate. This study investigates the impact of lean manufacturing tools on waste reduction focusing on Just-in-Time (JIT), Kanban, Kaizen, and Six Sigma. A quantitative research design was employed using purposive sampling to include individuals directly involved in production, such as production managers, quality managers, lean executives, supervisors and other relevant parties. Data were collected through a structured questionnaire and analyzed using descriptive statistics, reliability testing, and regression analysis to ensure methodological rigor and validity. The findings reveal that implementing lean manufacturing tools significantly reduces waste, improves process efficiency, and enhances product quality. Regression analysis confirmed that these lean practices account for a substantial portion of the variation in waste reduction, while reliability testing verified the internal consistency of the instrument. The study demonstrates that JIT, Kanban, Kaizen, and Six Sigma collectively support more sustainable and competitive manufacturing operations. Furthermore, it contributes to the theoretical understanding of lean manufacturing by providing empirical evidence from a developing country context, which is often underrepresented in literature. The results offer actionable insights for managers and policymakers, highlighting that lean practices not only address inefficiencies and waste but also promote cost-effective, efficient, and environmentally responsible production strategies. Overall, this research emphasizes the critical role of lean tools in fostering operational excellence, sustainability, workforce engagement, and global competitiveness in the Sri Lankan apparel sector.

Keywords: apparel industry, lean manufacturing, waste reduction